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UTILIZATION OF SOLID WASTE IN MAKING PALM SHELL FERTILIZER LIQUID POTASSIUM SULPHATE

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Abstrak

The palm waste is a the rest of the oil palm plantations that are not included in the main product or a by-product of palm oil processing. One type of solid waste palm oil industry is the oil palm shell. Oil palm shell has many elements of K,P, N_a, C_a, M_g, Z_n. Where one element of K is usually used to make liquid fertilizer of potassium sulfate.

The process of making a liquid fertilizer of potassium sulfate made by burning palm shells to ashes. Then the ash was dissolved in 500 ml of aquadest water and retrieved by filtering the extract. Mix 20 ml solution (K_2O) and 20 ml of H_2SO_4 concentration of 0,08;0,09; 0,1; 0,2; 0,3 M into a glass beaker. Turn styrer for 30, 40, 50, 60, 70 minutes by keeping the solution temperature at 70 ° C conditions. Do stirring with a speed of 200 rpm. Then do the analysis on the product obtained is K, and SO_4.

From this study obtained the best results in the addition of K_2O with the addition of 0.08M H_2SO_4 at 60 minutes with stirring K in K_2O fertilizer composition of 6.022,01 mg /L and SO_4 at 5.384,02 mg / L.

Key Words : Extract, Potassium Sulfate, Styrer, Shell, Glass Beaker.

1. INRODUCTION

Our land is an agricultural country. This means that agriculture in Indonesia is still a development priority. One important factor in supporting the successful cultivation of plant life is a matter of fertilizing (Saifuddin S, 1985).
In order to increase agricultural output that is required fertilizer nitrogen fertilizer, hosphate fertilizer and potash fertilizer in large quantities. Some fertilizer requirements that can already be influenced by the domestic mills that produce urea, ammonium sulphate, triple superphosphate, diammonium phosphate and compound fertilizer NPK. But potassium fertilizer is almost entirely remains to be imported, in 2002 imports reached 4.983.729 pounds of potassium fertilizers to achieve value for money of 1.436.310 US$ (Central Bureau of Statistics, 2002).
To reduce the amount of potash fertilizer import then tried to make a liquid fertilizer of potassium sulfate from the rind of solid waste (shells) Palm PT Taipan Nadenggan, Central Kalimantan.
Oil palm plantations for palm oil is a lot of wasted shells, where as the amount of waste every day very much. Each palm bunches, 60 percent are vacant, and if by products are not processed and be best utilized, it can disturb and harm the environment.
From each of these palm shell waste product, 12 percent could be fodder (cattle). And the rest, after processing into fertilizer for oil palm cultivation. Thus there is an unbrokencycle of nature (Kompas, 2000).
Potassium elements in the oil palm shell was reacted with sulfuric acid (H2SO4), to form potassium sulphate can be used as fertilizer and can be used in various chemical industries. Therefore, researchers try to take advantage of oil palm shell.
Research that we want to do this is to cultivate oil palm shell solid waste that can beused as liquid fertilizer of potassium sulfate (K2SO4) potential and environmentally friendly.

1.2 Research Purpose

Purpose of this study is to utilize solid waste from oil palm shell which is reacted with sulfuric acid to potassium sulfate and to determine the effect of several variables on the manufacture of potassium sulphate.

1.3 Benefits of Research

- Reduce the amount of potash fertilizer imports so as to save foreign exchange by State
- With the processing of solid waste from oil palm shell which was originally waste is just dumped and burned, so now have a very high added value for the extraction of potassium

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2. Theoretical basis

Based on the presence of potassium as K2O content in the shells of oil palm, then when reacted with sulfuric acid to form potassium sulfate and H2O.

$$K_2O_{(l)} + H_2SO_{4(l)} \rightarrow K_2SO_{4(l)} + H_2O_{(l)}$$

Above reaction mechanism is an irreversible reaction, the reaction goes in the direction, where the right reaction (product) can not return to the left (reactants). The mechanism of such reactions is an inorganic reactions, which generally lasts fast inorganic reactions(Vogel, 1979). As for the inorganic reactions are influenced by the stirring speed, temperature, and time.

The content of other elements in oil palm shell which can be bound by sulfuric acid, among others:

$$CaO + H_2SO_4 \rightarrow CaSO_4 + H_2O$$
$$MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O$$
$$Na_2O + H_2SO_4 \rightarrow NaSO_4 + H_2O$$

In addition to the above elements, there are also other elements of content but in very small quantities.

Factors that affect the manufacture of potassium sulphate fertilizer is :

a. Temperature

Temperature is a very important parameter for influencing the occurrence of chemical reactions and reaction rates. Generally the solubility of a solute that is extracted will increase with increasing temperature, so too will increase so that the overall diffusion will increase the reaction speed.

b. Long stirring (time)

Besides the effects of temperature, the dissolving process is also influenced by long stirring (time). Old stirring briefly in general will give results that are less good, this is because in a short time the leaching process has not reached the saturated condition. The longer the stirring is done then the solubility of a substance will be even greater.

c. Stirring speed

With the stirring then the diffusivity of a substance will increase so that the solubility of a substance will also increase.

This is because the rotation of stirring resulted in particles of matter can move freely in any direction which allows contact between the particles so quickly saturated condition is reached

3. Research Methods

Experimental Variables

In this study 100 ml reactor volume and speed are made permanent. The variables studied were

<u>Fixed Variable :</u>

1. Stirring : 200 rpm
2. Extract volume of ash : 20 ml
3. Volume H2SO4 : 20 ml
4. Operating temperature : 70^{o}C

<u>Variable Changes</u>

Long Stirring : 30, 40, 50, 60, 70 Minutes

H_2SO_4 Concentration : 0,08 ; 0,09 ; 0,1 ; 0,2 ; 0,3

3.1 Trial Procedures

1. Palm shell of solid waste PT. Tapian Nadenggan, Central Kalimantan, burned and the ashes taken.
2. Ash dissolved in water (20,04 grams of ash in 500 ml aquadest), then taken the extract by filtering.
3. Arrange the equipment as shown in Figure 1.
4. Enter a 20 ml solution in 100 cc glass beaker. This was followed by the addition of H2SO4 concentration and a predetermined volume into the glass beaker.
5. Use a thermometer to keep the solution temperature at 70 ° C conditions by dipping a thermometer into a glass beaker.
6. Turn stryrer during the allotted time (30, 40, 50, 60, 70) minutes and the stirring speed of 200 rpm.
7. After that the results are analyzed

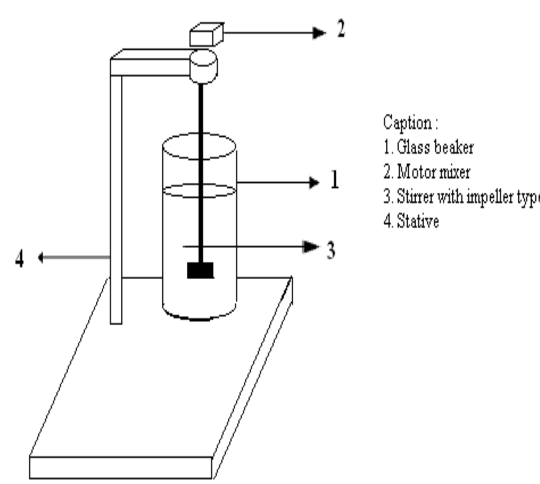

Figure 1

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4. Research Results

Time (minute)	Concentration (mg/L)	
	K	SO_4
30	1.690,03	4.270,03
40	3.017,06	5.286,05
50	5.431,10	6.675,01
60	6.022,01	5.384,02
70	4.896,06	4.228,09

Table I. Levels of K and SO_4 ions in the fertilizer on the addition of 0.08 M H_2SO_4

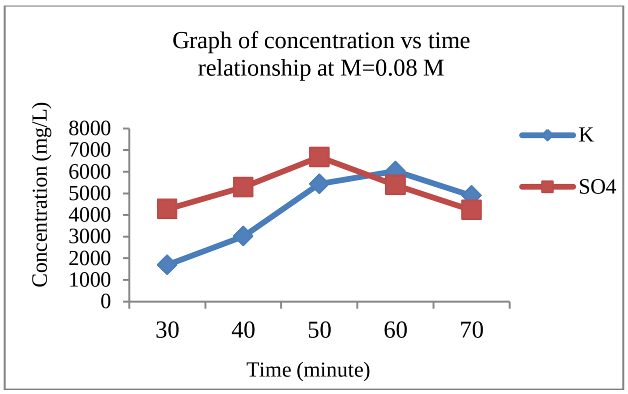

Figure 2. Relationship between the long stirring with K ions and SO_4 levels in the manure on the addition of 0.08 M H_2SO_4

In figure 2 shows that the longer the stirring then K and SO4 concentrations increase. This is because the longer the stirring time, the more K ions are bound by the SO4 ion.

On stirring after 60 minutes, levels of K in the fertilizer on the downside. This is because almost all of them bound K ions with SO4 ions. Where SO4 ions in a supersaturated state at stirring 50 minutes.

Time (minute)	Concentration (mg/L)	
	K	SO_4
30	1.299,04	3.886,07
40	2.332,01	4.275,02
50	4.633,07	5.076,05
60	5.755,03	5.156,08
70	5.009,06	5.012,03

Table II. Levels of K and SO_4 ions in the fertilizer on the addition of 0.09 M H_2SO_4

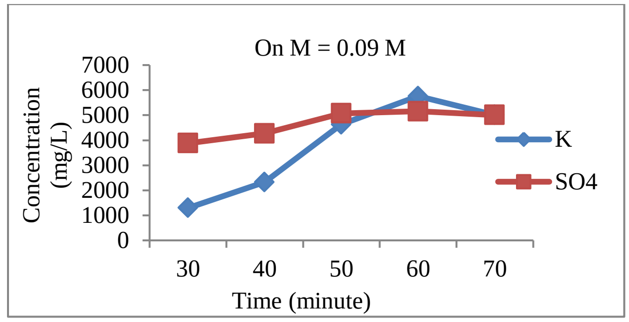

Figure 3. The relationship between the long stirring with K ions and SO_4 levels in the manure on the addition of 0.09 M H_2SO_4

In figure 3 shows that the longer stirring the K and SO_4 concentration increases. This is because the longer the stirring time, the more K ions are bound by the SO_4 ion.

On stirring after 60 minutes, levels of K in the fertilizer on the downside. This is because K ions can no longer be bound by the SO_4 ions (in a supersaturated state).

Time (minute)	Concentration (mg/L)	
	K	SO_4
30	807,02	2.929,09
40	1.849,01	3.286,06
50	2.547,04	3.938,01
60	5.902,06	4.775,07
70	5.441,07	4.344,02

Table III. K ions and SO_4 levels in the manure on the addition of 0.1 M H_2SO_4

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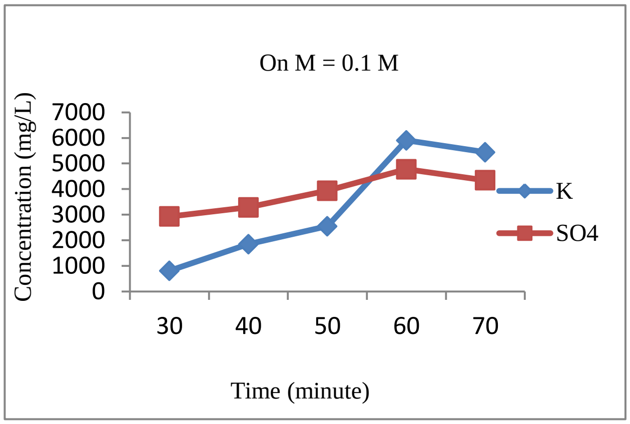

Figure 4. The relationship between the long stirring with K ions and SO_4 levels in the manure on the addition of 0.1 M H_2SO_4

In figure 4 shows that the longer stirring the K and SO_4 concentration increases. This is because the longer the stirring time, the more K ions are bound by the SO_4 ion.

On stirring after 60 minutes, levels of K in the fertilizer on the downside. This is because K ions can no longer be bound by the SO_4 ions (in a supersaturated state).

Time (minute)	Concentration (mg/L)	
	K	SO_4
30	1.048,02	2.284,06
40	1.228,08	3.842,09
50	2.904,06	4.294,03
60	5.918,05	3.894,06
70	4.802,03	3.859,04

Table IV. K ions and SO_4 levels in the manure on the addition of 0.2 M H_2SO_4

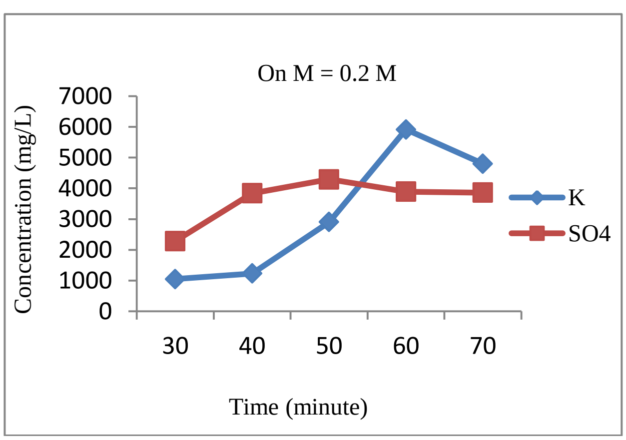

Figure 5. The relationship between the long stirring with K ions and SO_4 levels in the manure on the addition of H_2SO_4 0.2 M.

In figure 5 shows that the longer stirring the K and SO_4 concentration increases. This is because the longer the stirring time, the more K ions are bound by the SO_4 ion.

On stirring after 60 minutes, levels of K in the fertilizer on the downside. This is because almost all of them bound K ions with SO_4 ions. Where SO_4 ions, in a state of supersaturated at stirring 50 minutes.

Time (minute)	Concentration (mg/L)	
	K	SO_4
30	816,07	2.847,08
40	908,04	2.907,02
50	3.129,03	4.180,05
60	5.829,08	4.284,07
70	4.428,05	4.024,01

Table V. K ions and SO_4 levels in the manure on the addition of 0.3 M H_2SO_4

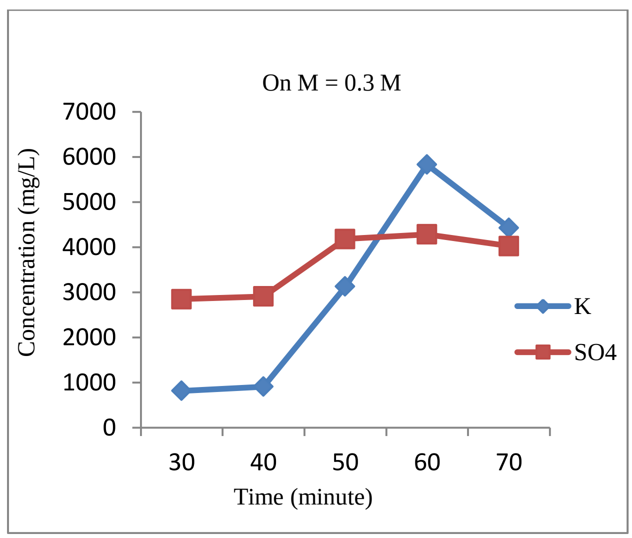

Figure 6. The relationship between the long stirring with K ions and SO_4 levels in the manure on the addition of 0.3 M H_2SO_4

In figure 6 shows that the longer the stirring then K and SO4 concentrations increase. This is because the longer the stirring time, the more K ions are bound by the SO4 ion.

On stirring after 60 minutes, levels of K in the fertilizer on the downside. This is because K ions can no longer be bound by the SO4 ions (in a supersaturated state)

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5. Conclusion

From the research that has been done, it can be concluded that the best fertilizer is happening at K2O solution of 20 ml of 0,08 M H2SO4 was added to 20 ml with stirring 60 minutes long. In these conditions the composition obtained in K2O fertilizer K at 6.022,01 and 5.384,02of SO4 mg / L.

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